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PATENT
Attorney Docket No. 401530

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:

KITAMURA et al.

Art Unit: 2834

Application No. 10/030,986

Examiner: P. Cuevas

Filed: January 16, 2002

For: EXCITATION CONTROL DEVICE AND
EXCITATION CONTROL METHOD

TRANSMITTAL OF
APPELLANTS' APPEAL BRIEF

U.S. Patent and Trademark Office
Randolph Building
401 Dulany Street, Customer Window, Mail Stop Appeal Brief - Patents
Alexandria, VA 22314

Dear Sir:

In accordance with 37 CFR 41.37, appellants hereby submit Appellants' Brief on Appeal.

The items checked below are appropriate:

1. Status of Appellants

This application is on behalf of ☒ other than a small entity or ☐ a small entity.

2. Fee for Filing Brief on Appeal

Pursuant to 37 CFR 41.20(2), the fee for filing the Brief on Appeal is for: ☒ other than a small entity or ☐ a small entity.

Brief Fee Due $500.00

3. Oral Hearing

☐ Appellants request an oral hearing in accordance with 37 CFR 41.47.

A separate paper requesting oral hearing is attached.

4. Extension of Time

☐ Appellants petition for a one-month extension of time under 37 CFR 1.136, the fee for which is $ 0.00.

☒ Appellants believe that no extension of time is required. However, this conditional petition is being made to provide for the possibility that appellants have inadvertently overlooked the need for a petition and fee for extension of time.

Extension fee due with this request: $

5. Total Fee Due

The total fee due is:

Brief on Appeal Fee	$500.00
Request for Oral Hearing	$ 0.00
Extension Fee (if any)	$ 0.00

Total Fee Due: $500.00

6. Fee Payment

☐ Attached is a check in the sum of $

☒ Charge Account No. 12-1216 the sum of $500.00. A duplicate of this transmittal is attached.

7. Fee Deficiency.

☒ If any additional fee is required in connection with this communication, charge Account No. 12-1216. A duplicate copy of this transmittal is attached.

Respectfully submitted,

Jeffrey A. Wyand, Reg. No. 29,458
LEYDIG, VOIT & MAYER
700 Thirteenth Street, N.W., Suite 300
Washington, DC 20005-3960
(202) 737-6770 (telephone)
(202) 737-6776 (facsimile)

Date: February 7, 2005
JAW/tps

Appeal Brief Transmittal (Revised 1/14/05)

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Dear Sir:

Further to the Notice of Appeal filed December 8, 2004, Appellants' now submit their Brief.

Real Party In Interest

The patent application that is the subject of this appeal is assigned to Mitsubishi Denki Kabushi Kaisha.

Related Appeals and Interferences

There are no prior or pending appeals, interferences, or judicial proceedings that are related to, directly affect, or may be directly affected by or have a bearing on the decision in this Appeal.

Status of Claims

This application was filed with four claims. None of those claims has been cancelled and no new claims have been added so that claims 1-4 remain pending. No claim is allowed and the final rejection of all claims is appealed. The claims on appeal appear in the Claims Appendix. The claims have not been amended since a Preliminary Amendment that was filed with the patent application to attend to matters of form.

Status of Amendments

No amendment was filed in response to the final rejection mailed September 22, 2004.

Summary of Claimed Subject Matter

The invention is directed to an excitation control apparatus and an excitation control method for a rotating electrical machine, more specifically a synchronous rotating electrical machine, such as a generator that is connected to a power system. In the power system, i.e., a grid, power generated by the synchronous generator is distributed and consumed by various electrical loads connected to the grid. It is well known in the art that changes in the electrical loads and other disturbances in the power system affect the voltage on and the current flowing in the power system. These disturbances feed back to the source of power, i.e., the generator, and produce variations in the voltage and current output by the generator. The variations may have varying amplitude as a function of time. The claimed excitation control apparatus and corresponding excitation control method are directed to responding to these disturbances so that the output voltage and current of the generator are restored to stable, steady values rapidly, and more quickly than in the prior art.

An example of the claimed apparatus is illustrated in Figure 4 of the application and an example of the claimed method is illustrated by the flow chart of Figure 5 of the patent application. These two figures support the independent claims 1 and 3, respectively. The dependent claims 2 and 4 are supported by Figures 7 and 9, respectively.

The apparatus of claim 1, with reference to the embodiment of Figure 4, includes a voltage detecting means, the transformer 26 of Figure 4, that detects the voltage at an output terminal of the synchronous generator 21. As can be seen in that embodiment of Figure 4, the generator is connected through a transformer 22 to a power grid including a transmission line 24 and a bus 25 from another generator. The claimed apparatus also includes a reactive current detecting means, represented by the transformer 27 in the embodiment of Figure 4. This reactive current detecting means detects the reactive current that is being produced by the synchronous machine 21.

An important feature of the invention is the voltage setting means, represented by the element 28 in Figure 4, that establishes a reference voltage for the output terminal of the synchronous machine. In other words, the output voltage that is desired to be present at the output terminal of the generator in a steady state condition is established by the voltage

setting means. In order to establish that reference voltage, the voltage setting means employs an internal function and two detected values. The two detected values are the reactive current that is detected by the reactive detecting means and a reference voltage that is intended to be present at the output side of the transformer that connects the synchronous machine to the power transmission system, transformer 22 in Figure 4. These input values are employed with a phase compensation transfer function of the voltage setting means that quickens attenuation of electrical power fluctuations, such as the fluctuations that occur in response to changing loads, as previously described. An example of such a phase compensation transfer function appears in equations (7) and (12) at pages 9 and 13 of the patent application.

Finally, the claimed apparatus includes a control means that controls the excitation system of the synchronous machine, i.e., the generator, based upon a difference between the reference voltage that is established by the voltage setting means and the voltage actually present at the output terminal of the synchronous machine and detected by the voltage detecting means. In the embodiment of Figure 4, the automatic voltage regulator (AVR) 30 corresponds to a least part of the control means and receives from the adder 29 the algebraic sum of the sensed voltage from the output terminal from the generator 21 and the reference voltage set by the voltage setting means. This algebraic sum is the difference referred to above, i.e., an error signal.

The apparatus according to claim 2 adds to the apparatus of claim 1 a connection supplying the voltage at the output terminal of the synchronous machine as an input to the voltage setting means. This additional input is employed in establishing the reference voltage at the output terminal of the generator. The connection described in claim 2 is illustrated in the embodiment of Figure 7.

Claims 3 and 4 are entirely analogous to claims 1 and 2, respectively, but are method claims. Thus, those claims are supported by the flow charts of Figures 5 and 8 which are analogous to the schematic diagrams of Figures 4 and 7. Therefore, detailed description of the claimed method is unnecessary because it is entirely parallel to the description already provided with regard to claims 1 and 2, but without reference numbers to examples of the physical elements that are specified in claims 1 and 2.

Grounds of Rejection to be reviewed on Appeal

Are claims 1-4 unpatentable over Frierdich et al. (U.S. Patent 4,264,856, hereinafter Frierdich) in view of Mori et al. (U.S. Patent 5,485,075, hereinafter Mori)?

Argument

All of claims 1-4 stand or fall together. Because the rejection of claims 1-4 as obvious fails both the threshold and secondary tests for establishing *prima facie* obviousness, the rejection must be reversed.

The fundamental requirement for establishing obviousness of a claim is a demonstration that all of the elements of the claim are known in the prior art. Even when all of the elements of a claim are shown to be present in the prior art, obviousness is not established unless motivation for making the combination, as in the claimed structure or method, is demonstrated. Here, there has been no showing that all of the elements of the independent claims 1 and 3 are present in the prior art. Further, based on the cited prior art, no motivation has been shown for combining the two publications applied in the rejection.

In several of the Office Actions relying upon Frierdich as the primary reference, the Examiner set forth his comparison between what is disclosed in Frierdich and what is claimed. The comparison includes, at the beginning, reference numbers indicating the elements of Frierdich that were compared to the elements of the claims. However, in the second half of each rejection, with one exception, reference numbers did not appear, presumably because the correspondence between claim and reference elements broke down.

According to the comparison made, the booster modules 41, 43, and 45 of Frierdich may be compared to the voltage setting means of claim 1 and the corresponding step of claim 3. In the Office Actions, these elements 41, 43, and 45 were stated to set a reference voltage of the output terminal of a synchronous machine according to a reference voltage at an output side of a transformer and a phase compensation transfer function that quickens attenuation of an electric power fluctuation. Appellants disagree with this characterization of Frierdich because the characterization is not supported by any cited passage of that patent. No transformer connecting Frierdich's generator to a power system is shown nor is there any description that any information, in Frierdich, is derived from a reference voltage at the output side of such a transformer. Thus, the second of the parameters for setting the reference voltage at the output terminal of the synchronous machine, according to claims 1 and 3, is not even an input value in Frierdich. Thus, Frierdich fails to supply this element of the claimed invention.

Second, Frierdich discloses no operation of the booster modules 41, 43, and 45 that in any way involves a phase compensation transfer function that reduces the time required to attenuate generator voltage fluctuations due to disturbances on a line that is being supplied with power by the synchronous machine. Although not determinative of what is disclosed in

substance by Frierdich, Frierdich never uses the term "transfer function", a term that becomes familiar to all electrical engineering students. Of course, the substance of what is disclosed in a reference is the important issue in determining whether the reference includes disclosure regarding a claim limitation, not the precise words employed in the reference. Nevertheless, a detailed review of the entire Frierdich disclosure fails to identify a description of anything equivalent in function to the phase compensation transfer function of the invention, the function that achieves an important advantage of the invention, i.e., rapidly recovering from an electrical disturbance in the system to which the synchronous machine is connected. See the specification at pages 8-10.

What is described in Frierdich is controlling the excitation of a synchronous machine in response to various overload conditions that might occur in a power system. It is beyond argument that this description relates to fluctuations in voltage or other electrical variables in a power system. However, the structure of the apparatus described by Frierdich and the method of operation of that apparatus are entirely different from the invention as defined by the claims on appeal.

In Frierdich, a compensating voltage is supplied to field windings of a generator and the magnitude of that compensating voltage is directly related to the number of phases of the three phase generator that are not short-circuited. See column 3, lines 36-42 of Frierdich. Perhaps the use of the term "phase" in two of its common meanings in the relevant arts, in Frierdich and in the claims, has led to confusion here. Frierdich properly refers to each output line of a multiple phase generator as a phase. That reference to a physical output conductor does not refer to the concept of a relative time position of an alternating current signal. The latter meaning, for example, pertains to a "phase shift" between two electrical signals or between the voltage and corresponding current of an alternating current system including reactive electrical components. Clearly, in the claim, with respect to the voltage setting means, it is the latter definition of "phase", rather than reference to a particular one of multiple output conductors from a multiple phase generator, that is being referred to. The former definition is the one being employed by Frierdich.

Stated another way, as made clear in Frierdich in the passage in column 3 from line 42 through line 64, the problem being addressed by Frierdich is sensing and responding to imbalances in currents flowing in the respective output lines from the multiphase generator. Appellants agree that such an imbalance could be the result of an electrical disturbance external to the generator. The point is, however, that Frierdich does not disclose "a phase compensation transfer function" or any equivalent way to accelerate correction of such an imbalance or any voltage fluctuation on the output lines. Thus, contrary to the assertion of

the final rejection, nothing in Frierdich discloses or even suggests the phase compensation transfer function feature of the voltage setting means of claim 1 or of the voltage setting step of claim 3.

The reliance placed upon Mori as the secondary reference in the rejection was with regard to a different element of the claims conceded to be missing from Frierdich. Claim 1 includes a reactive current detecting means for detecting the reactive current being output by the synchronous machine and claim 3 describes detecting the reactive current output by the synchronous machine. Appellants agree that Mori describes an apparatus in which reactive power is sensed. In fact, Mori describes attempting to stabilize a power system by, in part, controlling both reactive current and reactive voltage. The objective of Mori is to avoid switching losses that occur in a self-commutated converter. The converter is intended to switch connections of reactive components within a power distribution substation and a power distribution system to regulate reactive power. In other words, by connecting or disconnecting capacitors or inductors, Mori limits the amount of reactive power on the lines of the distribution system.

While Appellants readily agree that Mori describes a reactive current sensor employed in determining the amount of reactive power on a distribution line, Mori has essentially nothing in common with Frierdich. It almost appears that Mori was identified based upon a word search for a reactive current detector rather than for some disclosure that might suggest including a reactive current detector in the Frierdich apparatus.

There is no assertion in any Office Action that Mori describes or alludes to a phase compensation transfer function or its equivalent. Thus, neither of the references relied on includes an important feature of the claimed invention. The absence of that important feature means that *prima facie* obviousness cannot be established as to any of claims 1-4 because all of the elements of the rejected claims have not been shown to have been present in the prior art. Therefore, the rejection fails the basic test for establishing *prima facie* obviousness.

Even if a phase compensation transfer function were present in one or both of Frierdich and Mori, no motivation for modifying Frierdich with Mori has been cited. The only similarity of Frierdich and Mori is that both relate to different aspects of electrical power generation and distribution. The lack of relationship in function or objective of Frierdich and Mori demonstrates the absence of any motivation for modifying Frierdich with Mori as hypothesized in the final rejection. The conclusory statement to the contrary, at page 4 of the Office Action mailed September 22, 2004, finally rejecting the claims, is insufficient for establishing motivation to modify Frierdich with Mori. Thus, the second requirement for

prima facie obviousness has not been met. Accordingly, *prima facie* obviousness has not been established with respect to any pending claim.

In summary, if there were motivation to modify Frierdich with Mori, the resulting structure and method would still lack at least one element of claims 1 and 3, namely the voltage setting means and step that, based upon a phase compensation transfer function, hasten restoration of stability in the output of the synchronous machine in response to a disturbance on the electrical system supplied by the synchronous machine. However, not even the motivation for combining the references is present. Since neither of the essential requirements to establish *prima facie* obviousness of a claim has been fulfilled with respect to any claim pending in this patent application, the final rejection must be reversed.

Respectfully submitted,

Jeffrey A. Wyand, Reg. No. 29,458
LEYDIG, VOIT & MAYER
700 Thirteenth Street, N.W., Suite 300
Washington, DC 20005-3960
(202) 737-6770 (telephone)
(202) 737-6776 (facsimile)

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Appeal_Brief (Revised 09/15/04)

Claims Appendix

1. An excitation control device comprising:
voltage detecting means for detecting a voltage of an output terminal of a synchronous machine which is connected to a power transmission system through a transformer;

reactive current detecting means for detecting a reactive current output from the synchronous machine;

voltage setting means for setting a reference voltage of the output terminal of the synchronous machine according to the reactive current detected by the reactive current detecting means, a reference voltage of an output side of the transformer, and a phase compensation transfer function to quicken attenuation of an electric power fluctuation; and

control means for controlling an exciting system of the synchronous machine according to a difference between the reference voltage set by the voltage setting means and the voltage of the output terminal of the synchronous machine detected by the voltage detecting means.

2. The excitation control device according to claim 1, wherein the reference voltage of the output terminal of the synchronous machine is set by the voltage setting means based on the voltage of the output terminal of the synchronous machine detected by the voltage detecting means.

3. An excitation control method, comprising:
detecting a voltage of an output terminal of a synchronous machine which is connected to a power transmission system through a transformer;

detecting a reactive current output from the synchronous machine;

setting a reference voltage of the output terminal of the synchronous machine according to the reactive current, a reference voltage of an output side of the transformer, and a phase compensation transfer function to quicken attenuation of an electric power fluctuation; and

controlling an exciting system of the synchronous machine according to a difference between the reference voltage of the output terminal of the synchronous machine and the voltage of the output terminal of the synchronous machine.

4. The excitation control method according to claim 3, wherein setting the reference voltage of the output terminal of the synchronous machine includes setting the reference

voltage of the output terminal of the synchronous machine based on the voltage of the output terminal of the synchronous machine.

Evidence Appendix

No evidence was submitted during the prosecution of this patent application.

Related Proceedings Appendix

There are no related proceedings.